

Practitioner's Docket No. UDL 20015

119335613 020403
JC19 Rec'd/PCT/PTO .1 8 JUL 2001

CHAPTER 04 / 889608

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

**TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)
(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)**

INTERNATIONAL APPLICATION NO. PCT/GB00/00202 INTERNATIONAL FILING DATE 27 January 2000 PRIORITY DATE CLAIMED 28 January 1999

TITLE OF INVENTION

INK-RECEPTOR SHEET FOR USE AS A RECORDING MATERIAL

APPLICANT(S)

CALLAND, Steven George

Box PCT

Assistant Commissioner for Patents

Washington D.C. 20231

ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*

(When using Express Mail, the Express Mail label number is **mandatory**;
Express Mail certification is optional.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

☒ deposited with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

37 C.F.R. § 1.8(a)

37 C.F.R. § 1.10 *

☐ with sufficient postage as first class mail.

☒ as "Express Mail Post Office to Addressee"

Mailing Label No. EL852684041US (mandatory)

TRANSMISSION

☐ facsimile transmitted to the Patent and Trademark Office, (703) _____

Signature

Date: July 18, 2001

Stu M. Haas July 18, 2001
James W. McKee Steven M. Haas
(type or print name of person certifying)

* Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 1 of 9)

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

- I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:
- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
 - b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input checked="" type="checkbox"/> *	TOTAL CLAIMS	39 - 20 =	19	× \$18.00 =	\$ 342.00
	INDEPENDENT CLAIMS	4 - 3 =	1	× \$80.00 =	80.00
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00				
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) \$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) \$690.00 <input checked="" type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$710.00 <input checked="" type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) \$1000.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$860.00				\$1,000.00
	Total of above Calculations				= 1422.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Assertion must be made. (note 37 C.F.R. § 1.27)				- -
	Subtotal				\$1,422.00
	Total National Fee				\$ 1,422.00
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				-
TOTAL	Total Fees enclosed				\$ 1,422.00

*See attached Preliminary Amendment Reducing the Number of Claims.

- ☒ Attached is a ☒ check ☐ money order in the amount of \$ 1,422.00
☒ Authorization is hereby made to charge the amount of \$ (any deficiency)

☒ to Deposit Account No. 06-0308

☐ to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: Credit card information should *not* be included on this form as it may become public.

- ☒ Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

****WARNING:** "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

WARNING: If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

☐ **Assertion of Small Entity Status**

☐ **Applicant hereby asserts status as a small entity under 37 C.F.R. § 1.27.**

NOTE: 37 C.F.R. § 1.27(c) deals with the assertion of small entity status, whether by a written specific declaration thereof or by payment as a small entity of the basic filing fee or the fee for the entry into the national phase as states:

"(c) Assertion of small entity status. Any party (person, small business concern or nonprofit organization) should make a determination, pursuant to paragraph (f) of this section, of entitlement to be accorded small entity status based on the definitions set forth in paragraph (a) of this section, and must, in order to establish small entity status for the purpose of paying small entity fees, actually make an assertion of entitlement to small entity status, in the manner set forth in paragraphs (c)(1) or (c)(3) of this section, in the application or patent in which such small entity fees are to be paid.

(1) Assertion by writing. Small entity status may be established by a written assertion of entitlement to small entity status. A written assertion must:

(i) Be clearly identifiable;

(ii) Be signed (see paragraph (c)(2) of this section); and

(iii) Convey the concept of entitlement to small entity status, such as by stating that applicant is a small entity, or that small entity status is entitled to be asserted for the application or patent. While no specific words or wording are required to assert small entity status, the intent to assert small entity status must be clearly indicated in order to comply with the assertion requirement.

(2) Parties who can sign and file the written assertion. The written assertion can be signed by:

(i) One of the parties identified in §§ 1.33(b) (e.g., an attorney or agent registered with the Office), §§ 3.73(b) of this chapter notwithstanding, who can also file the written assertion;

(ii) At least one of the individuals identified as an inventor (even though a § 1.63 executed oath or declaration has not been submitted), notwithstanding §§ 1.33(b)(4), who can also file the written assertion pursuant to the exception under §§ 1.33(b) of this part; or

(iii) An assignee of an undivided part interest, notwithstanding §§ 1.33(b)(3) and 3.73(b) of this chapter, but the partial assignee cannot file the assertion without resort to a party identified under §§ 1.33(b) of this part.

(3) Assertion by payment of the small entity basic filing or basic national fee. The payment, by any party, of the exact amount of one of the small entity basic filing fees set forth in §§ 1.16(a), (f), (g), (h), or (k), or one of the small entity basic national fees set forth in §§ 1.492(a)(1), (a)(2), (a)(3), (a)(4), or (a)(5), will be treated as a written assertion of entitlement to small entity status even if the type of basic filing or basic national fee is inadvertently selected in error.

(i) If the Office accords small entity status based on payment of a small entity basic filing or basic national fee under paragraph (c)(3) of this section that is not applicable to that application, any balance of the small entity fee that is applicable to that application will be due along with the appropriate surcharge set forth in §§ 1.16(e), or §§ 1.16(l).

(ii) The payment of any small entity fee other than those set forth in paragraph (c)(3) of this section (whether in the exact fee amount or not) will not be treated as a written assertion of entitlement to small entity status and will not be sufficient to establish small entity status in an application or a patent."

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☐ is transmitted herewith.
- b. ☐ is not required, as the application was filed with the United States Receiving Office.
- c. ☒ has been transmitted
 - i. ☒ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308):
03 August, 2000
 - ii. ☐ by applicant on _____. (Date)

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☐ is transmitted herewith.
- b. ☒ is not required as the application was filed in English.
- c. ☐ was previously transmitted by applicant on _____. (Date)
- d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
b. ☐ have been transmitted
i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308):

ii. ☐ by applicant on _____. (Date)

- c. ☒ have not been transmitted as
i. ☒ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.):
02 May 2000
ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

- a. ☐ is transmitted herewith.
b. ☐ is not required as the amendments were made in the English language.
c. ☒ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

- ☒ is transmitted herewith.
☐ is not required as the application was filed with the United States Receiving Office.

8. ☒ Annex(es) to the international preliminary examination report

- a. ☒ is/are transmitted herewith.
b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☒ A translation of the annexes to the international preliminary examination report

- a. ☐ is transmitted herewith.
b. ☒ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115
- a. ☐ was previously submitted by applicant on _____. (Date)
 - b. ☐ is submitted herewith, and such oath or declaration
 - i. ☐ is attached to the application.
 - ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
 - c. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☒ is transmitted herewith.
 - b. ☐ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____
 - c. ☐ is not required, as the application was searched by the United States International Searching Authority.
 - d. ☐ will be transmitted promptly upon request.
 - e. ☐ has been submitted by applicant on _____. (Date)

12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

- a. ☒ is transmitted herewith.

Also transmitted herewith is/are:

- ☒ Form PTO-1449 (PTO/SB/08A and 08B).
- ☒ Copies of citations listed. (15)

- b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
- c. ☐ was previously submitted by applicant on _____. (Date)

13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

JC18 Rec'd PCT/PTO 1 8 JUL 2001

14. ☒ Additional documents:

- a. ☐ Copy of request (PCT/RO/101)
- b. ☒ International Publication No. WO 00/44568
- i. ☐ Specification, claims and drawing
- ii. ☒ Front page only
- c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
- d. ☐ Other

15. ☒ The above checked items are being transmitted

- a. ☒ before 30 months from any claimed priority date.
- b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 8 of 9)

☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☒ 37 C.F.R. § 1.17 (application processing fees)

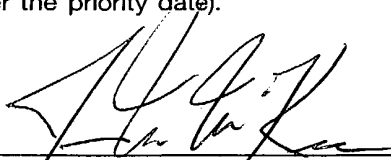
☐ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).



SIGNATURE OF PRACTITIONER

James W. McKee

(type or print name of practitioner)

FAY, SHARPE, FAGAN, MINNICH & MCKEE, LLP
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Customer No.:

09/889608

JC18 Rec'd PCT/PTO 1 8 JUL 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : CALLAND, Steven George
For : INK-RECEPTOR SHEET FOR USE
AS A RECORDING MATERIAL
Serial No. : (not yet assigned)
Filed : Herewith
Examiner : (not yet assigned)
Group Art Unit : (not yet assigned)
Attorney Docket No. : UDL 2 0015

Cleveland, Ohio
July 18, 2001

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to examination of this application and before calculating the filing fee, kindly amend the subject application as follows:

IN THE CLAIMS

Kindly amend claims 2, 3, 5, 7-10, 13, 15, 17-19, 28, 30 and 33-36 as follows:

"Express Mail" Mailing Label Number EL 852 684041 US
Date of Deposit July 18, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.
Steven M. Haas
(TYPED OR PRINTED NAME OF SENDER)
St M Haas
(SIGNATURE)

17. (Amended) A method according to claim 15, wherein the surface treatment including starch and polyvinyl alcohol is applied to the paper at a rate of 1 to 2g/m².

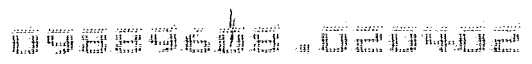
18. (Amended) A method according to claim 15, wherein a surface treatment including magnesium sulphate and polyvinyl pyrrolidone and a surface treatment including starch and polyvinyl alcohol are applied to the paper surface as separate treatments.

19. (Amended) A method according to claim 12, the method including treating the surface of the paper with a surface treatment including a soluble or insoluble metal from Groups II and III or the Transition Metals of the Periodic Table.

28. (Amended) Use of a recording sheet according to claim 20, wherein the binder substance is selected from a group consisting of polyvinylpyrrolidone, polyvinyl alcohol, carboxylated cellulosic polymers, polyacrylic acids, hydroxylated polyacrylates, polyacrylamides, starches and gelatine.

30. (Amended) Use of a recording sheet according to claim 28, wherein the binder substance has a molecular weight in the range 790,000 to 1,350,000.

33. (Amended) Use of a recording sheet according to claim 20, in which the substances are applied to the surface of the recording sheet as an aqueous solution.



34. (Amended) Use of a recording sheet according to claim 1, in which the recording sheet has a substantially uncoated appearance.

35. (Amended) Use of a recording sheet according to claim 1, the recording sheet being suitable for use on a digital press, in a lithographic printing process, for laser printing, inkjet printing with dye and pigment based inks and hot melt imaging.

36. (Amended) Use of a recording sheet according to claim 20, wherein the recording sheet is translucent or transparent.

[illegible]

This preliminary amendment has been presented to amend the claims to remove all multiple dependencies. Claims 1-39 are pending in the application; claims 1, 11, 20 and 37 are independent. All pending claims are submitted to be in condition for allowance, and notice to that effect is requested at the earliest possible date.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP

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Encl: Version with Markings to Show Changes Made

Version with Markings to Show Changes Made

Claims 2, 3, 5, 7-10, 13, 15, 17-19, 28, 30 and 33-36 have been amended as follows:

2. (Amended) Use of a recording sheet according to claim [2] 1, wherein the paper substrate contains between 50 and 400, preferably between 100 and 300, more preferably approximately 200 parts dry weight of aluminium trihydrate to 800 parts dry weight of pulp.
3. (Amended) Use of a recording sheet according to [any one of the preceding claims] claim 1, wherein the recording sheet has a surface treatment including magnesium sulphate and polyvinyl pyrrolidone.
5. (Amended) Use of a recording sheet according to [any one of the preceding claims] claim 1, wherein the recording sheet has a surface treatment including starch and polyvinyl alcohol.
7. (Amended) Use of a recording sheet according to claim 5 [or claim 6], wherein the surface treatment including starch and polyvinyl alcohol is applied to the paper at a rate of 1 to 2g/m².
8. (Amended) Use of a recording sheet according to [any one of the preceding claims] claim 1, wherein the recording sheet has a surface treatment including a soluble or insoluble metal from Groups II and III or the Transition Metals of the Periodic Table.

9. (Amended) Use of a recording sheet according to [any one of the preceding claims] claim 1, wherein the recording sheet is substantially opaque.

10. (Amended) A method of printing on a recording sheet using a digital printing press, characterised in that the recording sheet is as defined in [any one of the preceding claims] claim 1.

13. (Amended) A method according to claim 11 [or claim 12], the method including treating the surface of the paper with a surface treatment including magnesium sulphate and polyvinyl pyrrolidone.

15. (Amended) A method according to [any one of] claim[s] 11 [to 14], the method including treating the surface of the paper with a surface treatment including starch and polyvinyl alcohol.

17. (Amended) A method according to claim 15 [or claim 16], wherein the surface treatment including starch and polyvinyl alcohol is applied to the paper at a rate of 1 to 2g/m².

18. (Amended) A method according to [any one of] claim[s] 15 [to 17 when dependent on any one of claims 13 and 14], wherein a surface treatment including magnesium sulphate and polyvinyl pyrrolidone and a surface treatment including starch and polyvinyl alcohol are applied to the paper surface as separate treatments.

19. (Amended) A method according to [any one of] claim[s] 12 [to 19], the method including treating the surface of the paper with a surface treatment including a soluble or insoluble metal from Groups II and III or the Transition Metals of the Periodic Table.

33. (Amended) Use of a recording sheet according to [any one of] claim[s] 20 [to 32], in which the substances are applied to the surface of the recording sheet as an aqueous solution.

35. (Amended) Use of a recording sheet according to [any one of the preceding claims] claim 1, the recording sheet being suitable for use on a digital press, in a lithographic printing process, for laser printing, inkjet printing with dye and pigment based inks and hot melt imaging.

L:\SMH\PATENT\UDL\UDL20015.PRE

INK-RECEPTOR SHEET FOR USE AS A RECORDING MATERIAL

The present invention relates to a recording medium and in particular, but not exclusively, to a plain paper recording medium for use with the Indigo™ digital printing
5 press.

The Indigo digital press made by Indigo NV requires special paper surfaces to enable complete toner/ink transfer from printing blanket to paper. Such complete transfer is essential to allow variable information to be printed on successive sheets.

It is known that commercially available pigment coated printing papers satisfy the
10 requirement of 100% toner transfer, however for aesthetic and cost reasons printers wish to use papers of uncoated appearance. For instance: a translucent or semi-translucent paper would have its translucency diminished by pigment coating; coated papers are often glossy; the surface texture of an uncoated paper feels more natural.

Two processes have been developed to treat paper to render it suitable for the Indigo
15 press. One developed by Indigo NV and described in International patent application WO96/06384 is commercially known as the Sapphire treatment and involves treating the paper with polyethylene imine. That developed by Arjo Wiggins and described in EP 0879917 A2 involves use of a surface treatment that includes an aluminate salt or a salt of a weak acid/strong base to render the surface alkaline.

20 It is an object of the present invention to provide a paper or a range of papers of uncoated appearance that are suitable for use on an Indigo press and also in other digital and non-digital processes, and which also have an increased shelf life.

According to one aspect of the invention there is provided a recording sheet for use on a digital press, the recording sheet including a paper substrate containing an insoluble
25 mineral filler including a Lewis acid. The recording sheet may, for example, contain aluminium trihydrate ($\text{Al}(\text{OH})_3$). The recording medium may be an opaque paper including a surface treatment, for example polyvinyl pyrrolidone and magnesium sulphate or starch plus polyvinyl alcohol (PVOH).

Advantageously, the paper substrate contains between 50 and 400, preferably between 100 and 300, more preferably approximately 200 parts dry weight of aluminium trihydrate to 800 parts dry weight of pulp.

Advantageously, the recording sheet has a surface treatment including magnesium sulphate and polyvinyl pyrrolidone. The surface treatment may be applied to the paper at a rate of 2 to 4g/m².

Advantageously, the recording sheet has a surface treatment including starch and polyvinyl alcohol. The surface treatment may include an optical brightening agent. The surface treatment may be applied to the paper at a rate of 1 to 2g/m².

Advantageously, the recording sheet has a surface treatment including a soluble or insoluble metal from Groups II and III or the Transition Metals of the Periodic Table.

Advantageously, the recording sheet is substantially opaque.

According to another aspect of the invention there is provided a method of printing on a recording sheet using a digital printing press, characterised in that the recording sheet is as defined in any one of the preceding paragraphs.

According to another aspect of the invention there is provided a method of manufacturing a recording sheet for use on a digital press, the method including making up a slurry in water containing paper pulp and aluminium trihydrate, and forming the slurry into a web of paper on a paper machine.

Advantageously, the slurry contains between 50 and 400, preferably between 100 and 300, more preferably approximately 200 parts dry weight of aluminium trihydrate to 800 parts dry weight of pulp.

Advantageously, the method includes treating the surface of the paper with a surface treatment including magnesium sulphate and polyvinyl pyrrolidone, which surface treatment may be applied to the paper at a rate of 2 to 4g/m².

Advantageously, the method including treating the surface of the paper with a surface treatment including starch and polyvinyl alcohol, which surface treatment may include an optical brightening agent and may be applied to the paper at a rate of 1 to 2g/m².

Advantageously, the surface treatment including magnesium sulphate and polyvinyl pyrrolidone and the surface treatment including starch and polyvinyl alcohol are applied to the paper as separate treatments.

In a preferred embodiment, the invention is characterised by the presence of insoluble aluminium in the base and/or magnesium sulphate at the paper surface. The paper of the present invention is intended primarily for printing on an Indigo digital printing press. We have found that the use of an insoluble aluminium filler in the base makes the paper suitable for use in the Indigo press without the need for any special surface treatment. The paper is also suitable for use in the Xeikon digital printing press. Further, the paper has universal applicability, making it suitable for litho, inkjet, laser (mono and colour) printers and fountain pens. It has the aesthetic appearance of an uncoated paper, which gives it an advantage over some other Indigo printable papers that are of coated appearance. The coated papers that perform well in Indigo are usually designed primarily for litho and do not give good ink jet performance, so are not universal.

According to another aspect of the present invention there is provided a recording medium for use on a digital printing press (for example the Indigo press), the recording medium including a paper substrate having a surface treatment of a water-soluble cationic substance and a water-soluble binder. For example, the recording medium may comprise a translucent paper with a surface treatment of polyvinyl pyrrolidone (PVP) and magnesium sulphate (MgSO₄) with a synthetic sizing agent, for example Baysynthol KSN B. This formula has none of the drawbacks of available Indigo pre-treatments.

According to another aspect of the present invention there is provided a method of manufacturing a recording sheet for use on a digital press, the method including treating the surface of a paper substrate with a surface treatment including a water soluble cationic substance and a water soluble binder substance.

Embodiments of the invention will now be described by way of example.

We have found that three things work particularly effectively:

1. Translucent paper with a surface treatment of polyvinyl pyrrolidone + magnesium sulphate + Baysynthol KSN synthetic sizing agent.
- 5 2. Opaque paper with an insoluble mineral filler of aluminium trihydrate (Martifill) and a surface treatment of polyvinyl pyrrolidone + $MgSO_4$.
3. Opaque paper with an insoluble mineral filler of aluminium trihydrate and a conventional paper surface treatment, e.g. starch plus polyvinyl alcohol.

The results of using the above formulae are summarised in the following table:

10	Printability	Indigo	Litho	Inkjet inc. pigment inks	Hotmelt Inkjet	Laser (mono & colour)	Fountain pen
	Formula 1	yes	yes	yes	yes	yes	yes
	Formula 2	yes	yes	yes	yes	yes	yes
15	Formula 3	yes	yes	yes	yes	yes	yes

The surface treatment in formulae 1 and 2 is the same as the one we claimed for pigment based ink-jet on translucent paper, described in patent GB 2 301 845 B the contents of which are incorporated by reference herein. Formula 2 also includes
20 aluminium trihydrate as a filler in the base, in addition to the surface treatment.

It would seem that the Baysynthol is not essential for the Indigo process. The suitability of the paper for use in the Indigo process appears to depend on either the presence of either a soluble metal cation (Mg^{2+}) at the surface or a Lewis acid filler ($Al(OH)_3$) in the base or a slightly "tacky" polymer such as polyvinyl pyrrolidone or polyvinyl alcohol at
25 the surface of the paper. We suspect that the group II or III metals are the key. Further investigation of this aspect of the invention is required.

The preferred surface formulation for 1 and 2 is:

	parts by dry weight	e.g.
	magnesium sulphate	75
	polyvinyl pyrrolidone	25
5	Styrene copolymer size	0 to 2.5
	Typical application weight:	0.5 to 5 g/m ²

The styrene copolymer size is not essential in the formulation for formula 2 (opaques) but is needed in formula 1 (translucent papers).

10 Variants of the formulae, for example as described in GB 2 301 845B are possible. For example:

	cation:	polyvalent metals ions of groups II and III and transition metals of the periodic table
	cation:	poly quaternary amine or other Lewis acids
15	Binder:	starch, cationic starch, carboxymethyl cellulose, gelatine, polyvinyl alcohol, polyvinyl pyrrolidone, singly or in admixture of 2 or more
	Base:	opacity 20 to 98+, grammage 40 to 300
	Size:	styrene maleic anhydride, polyacrylate, styrene acrylate or other sizes known in the art

20 Formulation for Base for 2 and 3:

Aluminium hydroxide aka trihydrate (e.g. Martifill P2) 18% on dry fibre.

Possible variants include the internal sizes and different particle size of filler.

Surface formulation for 3

25	Starch	200 dry parts	e.g. oxidised potato - Amylox P45 from Avebe
	Polyvinyl alcohol	25 dry parts	e.g. gohsenol GL05 from Nippon Gohsei

Possible variants include cationic starch, other starches, different PVOHs.

30 For increased sheet brightness, an optical brightening agent (OBA) may be included in the surface treatment. We have found that it is beneficial to split the surface treatment into two applications: a) starch plus polyvinyl alcohol plus OBA and then b) magnesium sulphate plus polyvinyl pyrrolidone. The effect of this is to separate application of OBA and magnesium sulphate, which can react with each other and so mutually interfere with the desired function of each.

- The finished paper had an attractive, uncoated appearance and was found to give good results on the Indigo digital printing press, as well as in the Xeikon digital printing press and with litho, inkjet, mono and colour laser printers and fountain pens. The paper therefore has universal applicability.

CLAIMS

1. Use of a recording sheet in a digital printing process on a digital printing press, the recording sheet including a paper substrate containing an insoluble mineral filler, said filler including aluminium trihydrate.
- 5 2. Use of a recording sheet according to claim 2, wherein the paper substrate contains between 50 and 400, preferably between 100 and 300, more preferably approximately 200 parts dry weight of aluminium trihydrate to 800 parts dry weight of pulp.
3. Use of a recording sheet according to any one of the preceding claims, wherein the recording sheet has a surface treatment including magnesium sulphate and polyvinyl
10 pyrrolidone.
4. Use of a recording sheet according to claim 3, wherein the surface treatment including magnesium sulphate and polyvinyl pyrrolidone is applied to the paper at a rate of 2 to 4g/m².
5. Use of a recording sheet according to any one of the preceding claims, wherein the
15 recording sheet has a surface treatment including starch and polyvinyl alcohol.
6. Use of a recording sheet according to claim 5, wherein the surface treatment including starch and polyvinyl alcohol includes an optical brightening agent.
7. Use of a recording sheet according to claim 5 or claim 6, wherein the surface treatment including starch and polyvinyl alcohol is applied to the paper at a rate of 1 to
20 2g/m².
8. Use of a recording sheet according to any one of the preceding claims, wherein the recording sheet has a surface treatment including a soluble or insoluble metal from Groups II and III or the Transition Metals of the Periodic Table.
9. Use of a recording sheet according to any one of the preceding claims, wherein the
25 recording sheet is substantially opaque.
10. A method of printing on a recording sheet using a digital printing press, characterised in that the recording sheet is as defined in any one of the preceding claims.

11. A method of manufacturing a recording sheet for use in a digital printing process on a digital printing press, the method including making up a slurry in water containing paper pulp and aluminium trihydrate, and forming the slurry into a web of paper on a paper machine.
- 5 12. A method according to claim 11, wherein the slurry contains between 50 and 400 parts, preferably between 100 and 300 parts, more preferably approximately 200 parts dry weight of aluminium trihydrate to 800 parts dry weight of pulp.
13. A method according to claim 11 or claim 12, the method including treating the surface of the paper with a surface treatment including magnesium sulphate and polyvinyl
10 pyrrolidone.
14. A method according to claim 13, wherein the surface treatment including magnesium sulphate and polyvinyl pyrrolidone is applied to the paper at a rate of 2 to 4g/m².
15. A method according to any one of claims 11 to 14, the method including treating the surface of the paper with a surface treatment including starch and polyvinyl alcohol.
- 15 16. A method according to claim 15, wherein the surface treatment including starch and polyvinyl alcohol includes an optical brightening agent.
17. A method according to claim 15 or claim 16, wherein the surface treatment including starch and polyvinyl alcohol is applied to the paper at a rate of 1 to 2g/m².
18. A method according to any one of claims 15 to 17 when dependent on any one
20 claims 13 and 14, wherein the surface treatment including magnesium sulphate and polyvinyl pyrrolidone and the surface treatment including starch and polyvinyl alcohol are applied to the paper surface as separate treatments.
19. A method according to any one of claims 12 to 19, the method including treating the surface of the paper with a surface treatment including a soluble or insoluble metal from
25 Groups II and III or the Transition Metals of the Periodic Table.

20. Use of a recording sheet in a digital printing process on a digital printing press, the recording sheet including a paper substrate having a surface treatment including a water soluble cationic substance and a water soluble binder substance.
21. Use of a recording sheet according to claim 20, wherein the cationic substance is a
5 soluble polyvalent metal salt.
22. Use of a recording sheet according to claim 21, wherein the cationic substance is a salt of a metal from Groups II and III or the Transition Metals of the Periodic Table.
23. Use of a recording sheet according to claim 22, wherein the cationic substance is a salt of a cation selected from the group consisting of Mg^{2+} , Ca^{2+} , Al^{3+} , Zr^{4+} and Zn^{2+} .
- 10 24. Use of a recording sheet according to claim 23, wherein the cationic substance is magnesium sulphate.
25. Use of a recording sheet according to claim 24, wherein the amount of magnesium sulphate applied to the surface of the recording sheet is in the range $0.5-3.0g/m^2$, and preferably $1.0-2.0g/m^2$, and advantageously approximately $1.25-1.75g/m^2$.
- 15 26. Use of a recording sheet according to claim 20, wherein the cationic substance is a cationic polymer.
27. Use of a recording sheet according to claim 26, wherein the cationic substance is a poly-quaternary amine.
28. Use of a recording sheet according to any one of claims 20 to 27, wherein the binder
20 substance is selected from a group consisting of polyvinylpyrrolidone, polyvinyl alcohol, carboxylated cellulosic polymers, polyacrylic acids, hydroxylated polyacrylates, polyacrylamides, starches and gelatine.
29. Use of a recording sheet according to claim 28, wherein the binder substance is selected from a group consisting of carboxyalkyl polymers and hydroxyalkyl polymers, and
25 preferably hydroxymethyl cellulose and hydroxypropyl cellulose, and is more preferably carboxymethyl cellulose.

30. Use of a recording sheet according to claim 28 or claim 29, wherein the binder substance has a molecular weight in the range 790,000 to 1,350,000.
31. Use of a recording sheet according to claim 28, wherein the binder substance is polyvinyl pyrrolidone having a viscosity defined by a K-value of at least 30, and preferably at least 60 and advantageously approximately 90.
32. Use of a recording sheet according to claim 31, wherein the amount of PVP applied to the surface of the recording sheet is in the range 0.15-0.75g/m², and preferably 0.4-0.7g/m², and is advantageously approximately 0.5g/m².
33. Use of a recording sheet according to any one of claims 20 to 32, in which the substances are applied to the surface of the recording sheet as an aqueous solution.
34. Use of a recording sheet according to any one of the preceding claims, in which the recording sheet has a substantially uncoated appearance.
35. Use of a recording sheet according to any one of the preceding claims, the recording sheet being suitable for use on a digital press, in a lithographic printing process, for laser printing, inkjet printing with dye and pigment based inks and hot melt imaging.
36. Use of a recording sheet according to any one of claims 20 to 35, wherein the recording sheet is translucent or transparent.
37. A method of manufacturing a recording sheet for use in a digital printing process on a digital printing press, the method including treating the surface of a paper substrate with a surface treatment including a water soluble cationic substance and a water soluble binder substance.
38. A method according to claim 37, wherein the recording sheet is treated by applying an aqueous solution of the cationic and binder substances to the surface of the sheet.
39. A method according to claim 38, wherein the solution is applied by drawing the semi-manufactured recording sheet through a bath of the solution.

PCT

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(21) International Application Number: PCT/GB00/00202 (22) International Filing Date: 27 January 2000 (27.01.00) (30) Priority Data: 9901750.1 28 January 1999 (28.01.99) GB (71) Applicant (for all designated States except US): REXAM COATED PRODUCTS LIMITED [GB/GB]; 9th floor West, 114 Knightsbridge, London SW1X 7NN (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): CALLAND, Stevan, George [GB/GB]; 74 Bankbottom, Hadfield, Glossop SK13 1BX (GB). (74) Agent: RAYNOR, Simon, Mark; Urquhart-Dykes & Lord, Midsummer House, 411C Midsummer Boulevard, Central Milton Keynes MK9 3BN (GB).		(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> COPY <i>(front page only)</i>

(54) Title: INK-RECEPTOR SHEET FOR USE AS A RECORDING MATERIAL

(57) Abstract

A recording sheet for use on a digital press includes either insoluble aluminium trihydrate in the base paper or magnesium sulphate at the surface. According to a second aspect of the invention, the recording sheet includes a paper substrate having a surface treatment including a water soluble cationic substance and a water soluble binder substance.

DUPLICATE

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Attorney Docket No. UDL 2 0015

As a below inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought by patent application filed on the invention entitled:

**INK-RECEPTOR SHEET FOR USE
AS A RECORDING MATERIAL**

said patent application having *international application no. PCT/GB00/00202*, an *international filing date of 27 January 2000* and having been transmitted by the International Bureau of WIPO to the United States Patent and Trademark Office as a Designated Office on 03 August 2000 as noted on form PCT/IB/308, said application now assigned Serial No. 09/889,608.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to the patentability of this application in accordance with Title 37, code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application(s) for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

9901750.1
(Number)

Great Britain
(Country)

28 January 1999
(Filing Date)

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I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

Prior Provisional U.S. Patent Application(s):

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under Title 35, United States, Section 120 of any United States application(s) or any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information which is material to patentability as defined in Title 37, of Federal Regulations Code, Section 1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U.S. Application(s) or PCT Application(s) Designating the United States:

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27 January 2000
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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